Arrangement for influencing the yawing moment

The invention relates to a brake system for a motor vehicle, in particular for a utility vehicle, with a device for reducing the yawing moment on the front axle of the vehicle.

Modern electronic vehicle brake systems, such as ABS or EBS brake systems, have a device for reducing yawing moments on the front axle in order to make the vehicle controllable on a μ-split surface as well. Fundamentally, yawing moments, which are brought about by different rolling friction or static friction between the running wheels of a vehicle and the surface on which it moves, lead to the vehicle deviating laterally from the desired direction of travel. Yawing moments can lead to the vehicle skidding in particular during braking on bends.

Efforts are therefore made always to ensure sufficient vehicle stability in the development of brake systems, for example in pneumatic, hydraulic or hydraulic/pneumatic brake systems, and to stabilize the vehicle by adapted brake pressures. The pressure difference permissible on a vehicle axle between the brake cylinders for the running wheels of this axle is as a rule a compromise between controllability and steerability of the vehicle. It is generally the case that an empty vehicle with a short wheelbase is more critical to control than a vehicle with a long wheelbase. As the pressure difference between the brake cylinders concerned which is permissible in a brake system used in various vehicle types has to be geared to the critical vehicle type, the possible brake pressures are not utilized in a vehicle with a long wheelbase when this brake system is used.

A brake system for vehicles, in particular for utility vehicles, in which a sensor is provided for sensing a

physical quantity which occurs when a brake pressure defined by the driver is applied, is known from DE 199 39 035 A1, for example. In the known brake system, a hydraulic/pneumatic converter is provided, which is connected to an ABS valve and converts a brake pressure applied pneumatically to the converter into a hydraulic brake pressure for a vehicle brake. The sensor is integrated into the converter and responds and generates a warning signal when a pneumatic piston of the converter is in a stop position when the pneumatic/hydraulic converter is ventilated.

It is the object of the invention to improve a brake system of the kind mentioned in the introduction in such a way that driving safety is increased.

According to the invention, this object is achieved in that a device for measuring the slip on the rear axle or on two running wheels of the rear axle of the vehicle arranged on sides opposite one another is present and a regulating or control device for influencing the brake pressure on the front wheels is present which limits the brake pressure on the front wheels depending on the measured slip on the rear axle or on the running wheels of the rear axle.

Advantageous developments of the invention emerge from the subclaim, the description and the drawing.

In the development according to the subclaim, the regulating or control device multiplies the difference of the brake pressures on the front wheels by a value which is smaller than 1. In this way, the slip measured on the rear axle is taken into consideration for the braking behavior of the front axle.

In the same way, the invention relates to a brake system for a motor vehicle, in particular for a utility vehicle, which is characterized in that a device for

measuring the load on the rear axle or on two running wheels of the rear axle of the vehicle arranged on sides opposite one another is present and a regulating or control device for influencing the brake pressure on the front wheels is present which limits the brake pressure on the front wheels depending on the measured load on the rear axle or on the running wheels of the rear axle.

The yawing moment can also be influenced by this measure. With a high rear axle load, a high lateral guiding force is brought about, so that the permissible yawing moment on the front axle can be increased in comparison with an empty vehicle. This means that, with a low load on the rear axle, the permissible pressure difference of the running wheels on the front axle and thus the yawing moment on this axle is limited to a small value.

In an advantageous development for measuring the load on the rear axle, the regulating or control device multiplies the difference of the brake pressures on the front wheels by a value which is smaller than 1. The smaller the load on the rear axle, the smaller the factor is. With a load corresponding to 100% of maximum load, a load factor of 1 is obtained. With a lower load, correspondingly lower values are obtained.

In the case of control both based on measurement of the slip and also based on measurement of the load, the values for the permissible brake pressure difference on the front axle can also be obtained by interpolation.

The invention is explained in greater detail below in an illustrative embodiment with reference to the sole figure, which shows a greatly simplified diagram of a brake system.

A vehicle has a rear wheel axle with two running wheels on which a measuring unit 1, 2 is arranged in each case in order to measure the slip occurring on each of the two running wheels.

The values measured by the measuring units 1, 2 are conveyed to a regulating or control unit 5 via data lines 3, 4. From the values received, this unit generates a maximum value for the pressure difference still permissible on the front wheels and conveys this value to a measuring unit 6 to which the pressure values of brake cylinders 7, 8 on the front wheels are supplied.

From the pressure difference and/or the values measured in each case on the brake cylinders 7, 8, the regulating or control device 5 determines the maximum pressure permissible in each case for each brake cylinder 7, 8 or defines reduced values for each individual brake cylinder 7, 8 which are in each case conveyed either via the measuring unit 6 or directly to the brake cylinders 7, 8.

Instead of obtaining the values for the slip on the two running wheels of the rear axle, it is also sufficient in a simpler embodiment merely to measure the slip from the rear axle itself.

It is moreover possible by interpolation to store values for maximum permissible pressure differences on the front axle in a table, and thus to fix them, for all possible slip values on the rear axle.

Instead of slip measurement on the rear axle of the vehicle, it is also possible to determine the axle loads concerned and to derive therefrom values for the permissible pressure differences on the brake cylinders 7, 8 of the front axle.

In the same way, it is also possible to link the values for the slip and for the load with one another and to generate therefrom a permissible pressure difference for the front brake cylinders 7, 8. In this connection, tables of values can be drawn up, according to which the pressures in the brake cylinders 7, 8 are fixed at in each case maximum permissible values.

In practice, the time intervals of the slip measurements can also be standardized in a situationally adapted way, or fixed tables are input for each vehicle and for each measuring device so as always to ensure the safety of the vehicle even on changing surfaces.